DOCKET NO.: MSFT-1746/301620.01
Application No.: 10/611,774
Office Action Dated: September 18, 2007

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37 CFR § 1.116

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claim 1 (Previously presented): A method for providing a database view comprising transaction-consistent data reflecting the contents of a database at a specific point in time, said database comprising data elements and associated with a transaction log, said transaction log comprising active transactions and inactive transactions, said database view comprising difference storage for storing prior versions of at least one of said data elements from said database, said method comprising:

determining a split point on said transaction log corresponding to said point in time;

identifying each transaction on said transaction log prior to said split point which performs modifications on said database;

storing each of said modifications in said difference storage;

maintaining a side page table that comprises information regarding whether each data element is stored in the difference storage and whether each data element is allocated in the difference storage;

identifying each active transaction on said transaction log prior to said split point;

undoing any corresponding modifications in said difference storage; and

storing said difference storage.

Claim 2 (Original): The method of claim 1, further comprising:

initializing said difference storage.

Claim 3 (Previously Presented): The method of claim 1, wherein said determining said split point on said transaction log corresponding to said point in time further comprises disabling log truncation.

Claim 4 (Previously Presented): The method of claim 1, wherein said method further comprises initializing said side page table.

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Claim 5 (Original): The method of claim 1, wherein said step of undoing any corresponding modifications in said difference storage comprises deleting said corresponding modifications.

Claim 6 (Original): The method of claim 1, wherein said step of undoing any corresponding modifications in said difference storage comprises:

      reading corresponding unmodified data in said database; and

      writing said corresponding unmodified data in said difference storage.

Claim 7 (Original): The method of claim 1, wherein each of said data elements comprises a page of data.

Claim 8 (Original): The method of claim 7, wherein said difference storage comprises at least one sparse file.

Claim 9 (Original): The method of claim 8, wherein said step of storing each of said modifications in said difference storage comprises allocating a region of memory in one of said sparse files.

Claim 10 (Previously Presented): The method of claim 9, where each of said data elements comprises a page of data, and where said side page table comprises, for each page:

      first stored data indicating whether said page has been stored in said difference storage; and

      second stored data indicating whether said region has been allocated in said difference storage.

Claim 11 (Previously Presented): The method of claim 10, where said method further comprises:

      detecting that said side page table is invalid;

      for each region in said sparse files, determining whether said region has been allocated;

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for each region in said sparse files, setting said second stored data based on whether said region has been allocated.

Claim 12 (Original): The method of claim 10, where a determination of whether data is stored in a specific page in said difference storage comprises:

checking said first stored data, and if said first stored data indicates that said specific page has been stored in said difference storage, determining that data is stored in said specific page in said difference storage;

checking said second stored data, and if said second stored data indicates that said region has not been allocated in said difference storage, determining that data is not stored in said specific page in said difference storage; and

if said first stored data does not indicate that said page has been stored in said difference storage and said second stored data does not indicate that said region has not been allocated in said difference storage, reading page data from a corresponding area of said difference storage for said specific page, and determining if said page data from said corresponding area is valid.

Claim 13 (Previously Presented): The method of claim 7, where said side page table comprises, for each page:

first stored data indicating whether said page has been stored in said difference storage.

Claim 14 (Original): The method of claim 13, where a determination of whether data is stored in a specific page in said difference storage comprises:

checking said first stored data, and if said first stored data indicates that said specific page has been stored in said difference storage, determining that data is stored in said specific page in said difference storage; and

if said first stored data does not indicate that said specific page has been stored in said difference storage, reading page data from a corresponding area of said difference storage for said specific page, and determining if said page data from said corresponding area is valid.

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Claim 15 (Original): The method of claim 1, further comprising:

accepting a request for a specific data element in said database view;

determining if data is stored in a location corresponding to said specific data element in said difference storage;

responding to said request by reading said difference storage if data is stored in a location corresponding to said specific data element in said difference storage; and

responding to said request by reading said database if data is stored in a location corresponding to said specific data element in said difference storage.

Claim 16 (Original): The method of claim 15, where said step of determining if data is stored in a location corresponding to said specific data element in said difference storage comprises determining if said difference storage contains valid data in said location.

Claim 17 (Previously Presented): The method of claim 15, where said step of determining if data is stored in a location corresponding to said specific data element in said difference storage comprises consulting the side page table.

Claim 18 (Original): The method of claim 1, where said method further comprises:

detecting a modification made to said database storing a first specific value to a location in said database in place of a second specific data element;

determining if a corresponding location in said database view contains valid data;

if said corresponding location in said database view does not contain valid data, writing said second specific data element in said corresponding location.

Claim 19 (Previously Presented): At least one of an operating system, a computer-readable storage medium having stored thereon a plurality of computer-executable instructions, a co-processing device, and a computing device for performing the method of claim 1.

Claim 20 (Withdrawn): A system for providing a database view comprising transaction-consistent data reflecting the contents of a database at a specific point in time, said database comprising data elements and associated with a transaction log, said transaction log comprising active transactions and inactive transactions, said system comprising:

a split point determiner for determining a split point on said transaction log corresponding to said point in time;

a first transaction log analyzer for finding each transaction on said transaction log prior to said split point which performs modifications on said database;

difference storage for storing each of said modifications in said difference storage;

a second transaction log analyzer finding each active transaction on said transaction log prior to said split point; and

a difference storage modifier for undoing any corresponding modifications in said difference storage.

Claim 21 (Withdrawn): The system of claim 20, said split point determiner further comprising:

a log truncation disabler for disabling log truncation.

Claim 22 (Withdrawn): The system of claim 20, where said system further comprises:

a page table comprising data indicating whether a specific data element has been stored in said difference storage.

Claim 23 (Withdrawn): The system of claim 22, where said page table comprises:

first stored data indicating whether said specific data element has been stored in said difference storage.

Claim 24 (Withdrawn): The system of claim 23, where said difference storage comprises a sparse file and where said page table further comprises:

second stored data indicating whether a region corresponding to said specific data element has been allocated in said difference storage.

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Claim 25 (Withdrawn): The system of claim 24, where said system further comprises:

a region allocation determiner for, for each region in said sparse files, determining whether said region has been allocated; and

a second stored data setter for, for each region in said sparse files, setting said second stored data based on whether said region has been allocated.

Claim 26 (Withdrawn): The system of claim 20, further comprising:

a request responder for accepting a request for a specific data element in said database view, determining if data is stored in a location corresponding to said specific data element in said difference storage, responding to said request by reading said difference storage if data is stored in a location corresponding to said specific data element in said difference storage; and responding to said request by reading said database if data is stored in a location corresponding to said specific data element in said difference storage.

Claim 27 (Previously presented): A computer-readable storage medium for providing a database view comprising transaction-consistent data reflecting the contents of a database at a specific point in time, said database comprising data elements and associated with a transaction log, said transaction log comprising active transactions and inactive transactions, said database view comprising difference storage for storing prior versions of at least one of said data elements from said database, said computer-readable medium with instructions to perform acts comprising:

determining a split point on said transaction log corresponding to said point in time;

identifying each transaction on said transaction log prior to said split point which performs modifications on said database;

storing each of said modifications in said difference storage;

maintaining a side page table that comprises information regarding whether each data element is stored in the difference storage and whether each data element is allocated in the difference storage;

identifying each active transaction on said transaction log prior to said split point; and

undoing any corresponding modifications in said difference storage; and

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storing said difference storage.

Claim 28 (Previously Presented): The computer-readable storage medium of claim 27, said acts further comprising:

initializing said difference storage.

Claim 29 (Previously Presented): The computer-readable storage medium of claim 27, said determining said split point on said transaction log corresponding to said point in time further comprising:

disabling log truncation.

Claim 30 (Previously Presented): The computer-readable storage medium of claim 27, where said acts further comprise:

initializing said side page table.

Claim 31 (Previously Presented): The computer-readable storage medium of claim 27, where said step of undoing any corresponding modifications in said difference storage comprises:

deleting said corresponding modifications.

Claim 32 (Previously Presented): The computer-readable storage medium of claim 27, where said step of undoing any corresponding modifications in said difference storage comprises:

reading corresponding unmodified data in said database; and

writing said corresponding unmodified data in said difference storage.

Claim 33 (Previously Presented): The computer-readable storage medium of claim 27, where each of said data elements comprises a page of data.

Claim 34 (Previously Presented): The computer-readable storage medium of claim 33, where said difference storage comprises at least one sparse file.

Claim 35 (Previously Presented): The computer-readable storage medium of claim 34, where said act of storing each of said modifications in said difference storage comprises allocating a region of memory in one of said sparse files.

Claim 36 (Previously Presented): The computer-readable storage medium of claim 35, where each of said data elements comprises a page of data, and where said side page table comprises, for each page:

first stored data indicating whether said page has been stored in said difference storage; and

second stored data indicating whether said region has been allocated in said difference storage.

Claim 37 (Previously Presented): The computer-readable storage medium of claim 36, where said acts further comprise:

detecting that said side page table is invalid;

for each region in said sparse files, determining whether said region has been allocated;

for each region in said sparse files, setting said second stored data based on whether said region has been allocated.

Claim 38 (Previously Presented): The computer-readable storage medium of claim 36, where a determination of whether data is stored in a specific page in said difference storage comprises:

checking said first stored data, and if said first stored data indicates that said specific page has been stored in said difference storage, determining that data is stored in said specific page in said difference storage;

checking said second stored data, and if said second stored data indicates that said region has not been allocated in said difference storage, determining that data is not stored in said specific page in said difference storage; and

if said first stored data does not indicate that said page has been stored in said difference storage and said second stored data does not indicate that said region has not been allocated in

said difference storage, reading page data from a corresponding area of said difference storage for said specific page, and determining if said page data from said corresponding area is valid.

Claim 39 (Previously Presented): The computer-readable storage medium of claim 33, where said side page table comprises, for each page:

> first stored data indicating whether said page has been stored in said difference storage.

Claim 40 (Previously Presented): The computer-readable storage medium of claim 39, where a determination of whether data is stored in a specific page in said difference storage comprises:

> checking said first stored data, and if said first stored data indicates that said specific page has been stored in said difference storage, determining that data is stored in said specific page in said difference storage; and

> if said first stored data does not indicate that said specific page has been stored in said difference storage, reading page data from a corresponding area of said difference storage for said specific page, and determining if said page data from said corresponding area is valid.

Claim 41 (Previously Presented): The computer-readable storage medium of claim 27, said acts further comprising:

> accepting a request for a specific data element in said database view;

> determining if data is stored in a location corresponding to said specific data element in said difference storage;

> responding to said request by reading said difference storage if data is stored in a location corresponding to said specific data element in said difference storage; and

> responding to said request by reading said database if data is stored in a location corresponding to said specific data element in said difference storage.

Claim 42 (Previously Presented): The computer-readable storage medium of claim 41, where said step of determining if data is stored in a location corresponding to said specific data element

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Application No.: 10/611,774
Office Action Dated: September 18, 2007

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PROCEDURE PURSUANT TO
37 CFR § 1.116

in said difference storage comprises determining if said difference storage contains valid data in said location.

Claim 43 (Previously Presented): The computer-readable storage medium of claim 41, where said act of determining if data is stored in a location corresponding to said specific data element in said difference storage comprises consulting said side page table.

Claim 44 (Previously Presented): The computer-readable storage medium of claim 27, where said computer-readable medium further comprises:

      detecting a modification made to said database storing a first specific value to a location in said database in place of a second specific data element;

      determining if a corresponding location in said database view contains valid data;

      if said corresponding location in said database view does not contain valid data, writing said second specific data element in said corresponding location.